OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL

BIOLOGY

BL05 (9610)

Unit 5 Synoptic paper

Mark scheme

June 2023

Version: 1.0 Final

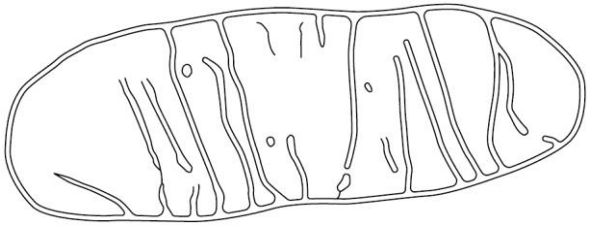
236XBL05/MS

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

Question	Marking guidance	Mark	Comments
01.1	Transmission electron (microscope);	1	Ignore TEM

Question	Marking guidance	Mark	Comments
01.2	1. Drawing large and clear **and** correct shape with envelope of 2 membranes; 2. Correct internal details of cristae and matrix granules;	2	≥ ½-size of Fig.1, smooth lines (not sketchy) Example: 

Question	Marking guidance	Mark	Comments
01.3	1.20 (μm^3);;;	3	Accept answer in range 1.07 to 1.34 for 3 marks Allow 1 mark for Volume = $\pi r^2 h = 3.14 \times 0.396^2 \times 2.433$ Allow length measurement, $\pm$ 1mm = 146 $\pm$ 1 mm Allow width/diameter measurement = 45 – 50 mm Max. 2 marks if d used instead of r Max. 2 marks if answer not to 3 significant figures Max. 2 marks if calculation using mm instead of μm: e.g. $3.14 \times 24^2 \times 146 \div 60\,000 = 4.40$

Question	Marking guidance	Mark	Comments
01.4	(0.25 mol dm^{-3} sucrose): Same/similar ψ as mitochondria/organelles/cells; prevents (net) entry/exit of water into/out of mitochondria/organelles **or** mitochondria**/**organelles do not burst/shrink; (pH7.4): Prevent denaturation of proteins/enzymes/cytochromes; (Temperature of 4 °C): slows chemical reactions **or** slows hydrolysis (of organic substances in mitochondria) **or** slows enzyme activity;	4	 Allow isotonic Allow prevents osmosis affecting mitochondria Ignore prevent cells burst/shrink Allow description of denaturation ignore optimum pH Ignore stops chemical reactions

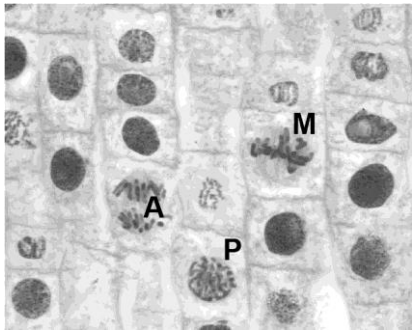
Question	Marking guidance	Mark	Comments
01.5 **(Mark with 01.6)**	In sequence: 5. Nuclei 6. Mitochondria 8. Ribosomes;	1	

Question	Marking guidance	Mark	Comments
01.6 **(Mark with 01.5)**	Heaviest/largest / most dense sedimented at low speed / g **OR** Nuclei are heaviest/largest / most dense **or** ribosomes are lightest/smallest / least dense;	1	Allow heaviest/largest / most dense sedimented first Allow mitochondria are intermediate in density between nuclei and ribosomes

Question	Marking guidance	Mark	Comments
01.7	Succinate is oxidised **OR** succinate produces reduced coenzyme; (Coenzyme) passes electrons/hydrogen (down ETC) to oxygen **OR** converts oxygen to water;	2	Allow reduced FAD / reduced NAD Allow oxygen is the final electron acceptor

Question	Marking guidance	Mark	Comments
01.8	1. Converted to ATP (in ETC); 2. By oxidative phosphorylation **OR** passes electrons/hydrogen (down ETC) to oxygen;	2	Allow oxygen is the final electron acceptor

Question	Marking guidance	Mark	Comments
01.9	(From graph) Prevents use of oxygen **OR** Electrons/hydrogen not transferred to oxygen; So reduced/no ATP production **or** less oxidative phosphorylation; Less/no (usable) energy released/transferred (for metabolism);	3	Ignore oxygen does not decrease Allow prevents oxygen acting as an electron acceptor Allow so NAD / FAD not regenerated and not available for further oxidation reactions / Glycolysis / Krebs cycle

Question	Marking guidance	Mark	Comments
02.1	(On **Figure 4**) **A** on one cell in anaphase; **M** on one cell in metaphase; **P** on one cell in prophase;	3	 Allow alternative correct answers for **P**

Question	Marking guidance	Mark	Comments
02.2	1. Place (end) section of root in (hot) acid (and wash end section of root in water); 2. Cut tip from root section (and place onto microscope slide); 3. Add stain (to distinguish the chromosomes); 4. Break up the tissue (with a mounted needle); 5. Cover with a coverslip **and** squash/apply pressure (and blot off excess stain from outside of coverslip);	5 max	1. Allow fixing in hydrochloric acid **or** ethanoic acid – ethanol mixture 2. Allow end 2 to 5 mm 3. Allow reference to named stain – eg toluidine blue or aceto-orcein Allow different sequence for steps 1 and 2 **or** 2 and 3 **or** 3 and 4

Question	Marking guidance	Mark	Comments
02.3	0.24;	1	

Question	Marking guidance	Mark	Comments
02.4	1. Student **6**'s value is > 2SD below class value; 2. Expect this variation by chance in < 5% of cases (so difference is significant);	2	Allow expect 95% of values within mean ± 2SD Reject 'the results are significant' If no other marks awarded, allow 1 mark for value is > 1SD below class value

Question	Marking guidance	Mark	Comments
02.5	(Mistake): Cells taken from region too far from root tip; (Reason): High proportion of cells in interphase **OR** Low proportion of cells in mitotic phases / in mitosis;	2	Allow not taken from the tip/meristem / region of cell division

Question	Marking guidance	Mark	Comments
03.1	Codominant – (Expressed in phenotype in homozygous genotype and) expressed differently / partially / diluted / blends in heterozygous genotype **or** both expressed in heterozygous genotype; Dominant – Expressed in phenotype in both homozygous genotype **and** in heterozygous genotype;	2	Allow 1 mark for correct definitions but only 3 of the 4 words used

Question	Marking guidance	Mark	Comments
03.2	Parental genotypes I^AI^O and I^BI^O ; Genotypes of gametes I^A I^O and I^B I^O ; Offspring genotypes I^AI^B and I^AI^O and I^BI^O and I^OI^O ; Offspring phenotypes AB and A and B and O ;	4	Allow gametes correct from incorrect P genotypes Ignore references to **X** and **Y** Allow offspring genotypes correctly derived from incorrect gametes Allow offspring phenotypes correctly derived from incorrect offspring genotypes but only if I^AI^B and I^OI^O present in offspring genotypes

Question	Marking guidance	Mark	Comments
04.1	1. Heat (in an oven) at temperature 95–105 °C; 2. To constant mass;	2	

Question	Marking guidance	Mark	Comments
04.2 **(Mark with 04.3 and 04.4)**	<u>On graph paper:</u> Suitable scales and axes labelled including units; Points plotted correctly;; Lines drawn correctly + labels / key;	4 max	 > ½-axis for spread of data **and** correct orientation Allow ± ½-small square All 10 points correct = 2 marks 8 or 9 points correct = 1 mark Either 2 smooth curves of best fit or ruled point-to-point Bar graph: max. 1 for plotting

Question	Marking guidance	Mark	Comments
04.3 **(Mark with 04.2 and 04.4)**	34.1;;	2	Allow 34.0 if ÷ 75 for each rate Allow 1 mark for $\frac{5.5 - 4.1}{4.1} \times 100$ **or** $\frac{1.4 \times 100}{4.1}$ Allow values from student's graph Allow 1 mark for 34.14634..../ 34.14 / 34.15 / 34.146 / etc

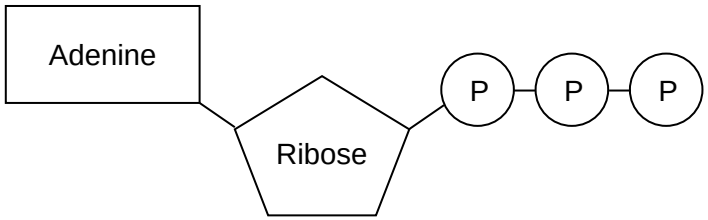
Question	Marking guidance	Mark	Comments
04.4 **(Mark with 04.2 and 04.3)**	1. GA_3-treated reach maturity 28 days before control / untreated; 2. Prolongs harvesting season (so increases sales / profits);	2	Allow correct time measurement from answer to **04.2** e.g. GA_3 at 72 days and control at 100 days

Question	Marking guidance	Mark	Comments
05.1	1. Only mate with those of high(est) omega-3:omega-6 ratio **OR** Only mate with those of high(est) omega-3 2. Repeat in subsequent generations **or** repeat with offspring;	2	1. Ignore alleles 2. Allow repeat over time

Question	Marking guidance	Mark	Comments
05.2	Any sensible suggestion – eg Ingested omega-3 may be altered by sheep's metabolism **OR** may be used in respiration **OR** may not enter muscle/meat **OR** may not be absorbed from gut **OR** may be genetically determined (so food has no influence);	1	 Ignore omega-3 would be digested Ignore omega-3 would be excreted

Question	Marking guidance	Mark	Comments
05.3	1. More mRNA in cell than DNA; 2. Introns / non-coding bases removed in mRNA; 3. mRNA only contains RNA for the desired gene **or** mRNA is specific;	2 max	 Allow the mRNA only contains exons Allow mRNA has undergone splicing

Question	Marking guidance	Mark	Comments
05.4	1. If cells successfully GM, then they contain resistance gene **OR** Can select which cells have been successfully GM; 2. Only GM cells survive treatment with the antibiotic;	2	

Question	Marking guidance	Mark	Comments
06.1	<u>Structure of ATP = 2 marks :</u> 1. and 2. Adenine-ribose-phosphate-phosphate-phosphate;; <u>Functions of ATP (any **four** for 4 marks):</u> 1. Active transport – eg ions into plant roots **OR** nerve impulse Na^+ & K^+ **or** H^+ ions for stomatal opening **OR** glucose / amino acid absorption from small intestine; 2. Protein synthesis – eg peptide bond formation / joining amino acids; 3. Synthesis of other organic molecules – eg Acetylcholine /RNA/DNA; 4. Light independent reactions of photosynthesis – e.g. GP to TP; 5. Phosphorylation/activation of glucose in glycolysis; 6. Muscle contraction – to move myosin head / to re-set cross-bridges; 7. Mitosis / meiosis – movement of chromosomes; 8. Hormone action – formation of cyclic-AMP;	6 max	Allow 2 marks for correct drawing, eg  Allow 1 mark for structure if: Base instead of adenine **OR** sugar/pentose instead of ribose **OR** if just list of components – ribose, adenine, 3 phosphates If no other marks awarded for functions, allow: Provision of energy for anabolic/metabolic processes **OR** 'energy currency of the cell'

Question	Marking guidance	Mark	Comments
06.2	1. Same volume (and concentration) of starch suspension **and** same volume (and concentration) of amylase solution 2. Add pH buffer solution (for optimum pH); 3. Maintain a suitable range of temperatures with a water bath (at least 5) between 0 °C and 80 °C; 4. Pre-incubate starch and amylase in separate tubes at T °C; 5. Mix starch and amylase and return to water bath at T °C; 6. Remove samples and test at suitable intervals eg every ½ to 2 min with either iodine-KI/iodine solution **OR** Benedict's; 7. Record time taken until iodine-KI stays yellow/brown/non-blue-black **OR** until Benedict's gives standard amount red/orange precipitate; 8. Repetitions and mean (for each T °C); 9. Further repetitions at smaller intervals around T °C for shortest time taken;	6 max	Ignore 'amount' 6. Allow record time until a negative result (with iodine)

Question	Marking guidance	Mark	Comments
06.3	1. Glucose as a source of energy/ATP – via respiration; 2. Starch (plants) for glucose/energy storage – large/insoluble /compact; 3. Glycogen (animals) for glucose/energy storage – large/insoluble /compact; 4. Cellulose in plant cell walls – support **or** protection; 5. Peptidoglycan / murein / glycoprotein in bacterial cell wall – support **or** protection; 6. Antibodies (= glycoprotein) – immune response **or** response to pathogens; 7. Glycolipids/glycoproteins on cell membranes – extra detail e.g. cell recognition **or** hormone binding sites; 8. Nucleotides and nucleic acids eg ribose in RNA / deoxyribose in DNA – genes **or** gene expression; 9. Glucose for maintenance of osmotic potential of blood – maintain osmotic balance for body cells; 10. Sucrose for transport in plants – extra detail e.g. small / soluble **or** via the phloem; 11. Sucrose in nectar – for pollination in plants; 12. Lactose in milk – source of energy via respiration	6 max	2. or 3. Allow branched structure – so quick release of glucose (for energy) by hydrolysis

Question	Marking guidance	Mark	Comments
QWC	Quality of written communication These are awarded for correct use of scientific terms and the ability to present a clear, logical account. They are not awarded for spelling, punctuation and grammar. 2 marks for an answer in which technical terms are used correctly throughout and the accounts are presented clearly and logically. 1 mark for an answer in which most technical terms are used correctly and most of the accounts are presented clearly and logically. 0 marks for an answer in which few technical terms are used correctly or the accounts are seldom presented clearly and logically.	2	Award mark for overall performance in 06.1, 06.2 and 06.3